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VITAL REDUNDANCY

THE CASE FOR ORGANIC AIRLIFT CAPABILITY IN AIR FORCE SPECIAL OPERATIONS COMMAND

By

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Abstract

Air Force Special Operations Command (AFSOC) today faces a critical shortage of airlift capacity. The Air Mobility Command (AMC) system that should ideally support AFSOC's airlift requirements is saturated with the demands of the post-9/11 world, so AFSOC cannot always get airlift support when and where it needs it. Ten years ago AFSOC got almost all the support it asked for, and it was able to fill minor gaps by using its special-purpose C-130s, including its MC-130H Talon II. But these aircraft and their crews are now critically overworked at the same time, and for the same reasons, as AMC's fleet. Further, the low-density nature of AFSOC's C-130 fleet means that increased maintenance requirements affect a significant percentage of the force, thereby decreasing mission capability. Though the concept would have been doctrinally unsupportable ten years ago, it is now necessary to build organic airlift capability into AFSOC.

A special operations airlifter should be able to operate from the airfields AFSOC currently uses, while giving the command increased capabilities in areas like range, speed, and payload. AFSOC could look at several aircraft as candidates, including the C-27J, C-130J, and KC-767. Analysis indicates, however, that the C-17A has nearly five times the payload and almost 13 times the ton-mile capacity of the MC-130H, and the C-17 can operate from most of the airfields AFSOC uses today. The C-17A was conceived and designed as a military airlifter; AFSOC should consider the C-17A as a suitable special operations airlift platform.

Part 1

History

Mass. Special operations concentrate combat power at critical times and in discriminate places to achieve decisive results. Massing combat power while avoiding concentration of forces can enable numerically inferior SOF to achieve decisive results while minimizing both human loss and the wasting of resources. SOF's ability to strike at key nodes may create results equivalent to those achievable by large force concentrations.

—Air Force Doctrine Document 2-7, *Special Operations*

Pope Air Force Base, March 1999

The pilot of Ghost 42 banks his AC-130 gunship into the overhead pattern, having completed the three-hour flight from Hurlburt Field, Florida. He and his crew are part of an Air Force Special Operations Command (AFSOC) deployment package that will, over the next two weeks, conduct training exercises with special operations forces (SOF) from neighboring Fort Bragg. The AFSOC contingent includes another gunship, two MC-130H Combat Talon II aircraft, and four MH-53 Pave Low helicopters, plus the associated maintenance and support personnel and equipment. Below Ghost 42, the pilot can see the Talon IIs, which arrived 45 minutes earlier, already parked on the ramp; the other gunship is taxiing past the two C-17s that

carried most of the maintenance and support equipment to Pope. Most of the maintainers, who flew in on the Talon IIs, are still on or near the flight line; some of them work with a C-5 crew to unload one of the MH-53s that was packaged and airlifted to Pope as part of the training exercise. The other three Pave Lows are over Georgia receiving fuel from an MC-130P Combat Shadow; they should arrive at Pope in three hours.

Afghanistan, March 2004

A company of coalition SOF (CSOF) has arrived at Kandahar Air Base and must move with their equipment to a remote location in western Afghanistan, where they will operate for the next six months. Surface transportation is not available, so the Combined Force Special Operations Component Commander (CFSOCC) has tasked the Combined Joint Special Operations Air Component (CJSOAC) to support the CSOF movement. Their operating location will be more than sixty miles from the nearest airfield, but moving the entire company and their equipment by helicopter could take more than a week. The plan calls for a combat control team (CCT) to fly into the area on an MH-47G Chinook helicopter and establish a landing zone on a straight section of road. An AC-130 will visually clear the landing zone prior to the Chinook's arrival and will maintain over-watch during the insertion. Two MC-130Hs carrying most of the CSOF personnel will follow the Chinook at 30-minute intervals. Three more Talon IIs will deliver the equipment and remaining personnel at 60-minute intervals, and the CCT will depart on the last airplane. A sixth MC-130H will fly to Kandahar as a spare; limited ramp space will require the five primary aircraft to fly from their forward operating base, load, deliver, and return to their base on the same day. None of the crews will be able to deliver more than one load within their 16-hour duty day, so the mission will require all six Talon IIs currently deployed in support of Operation Enduring Freedom (OEF).

Reality Check

These two scenarios are fictitious but not unrealistic. *March 1999* represents the kind of coordinated, specialized training that helped prepare the men and women of AFSOC for the missions they would execute after 9/11 – missions like the one described in *March 2004*. The two scenarios are included here neither for comparison nor as recruiting tools for AFSOC, but rather to highlight their most important similarity: ***neither scenario is possible in March 2009***. The critical shortfall lies not with the proficiency, resourcefulness, or training of the personnel; these missions would fail in the planning stages because AFSOC no longer has the capability to move those personnel and their equipment as described in the scenarios.

This is not to imply that AFSOC was ever in the airlift business; it has, in fact, traditionally depended upon Air Mobility Command (AMC) to support most of its airlift requirements. AFSOC used its Low-Density/High-Demand (LD/HD) special-purpose C-130 variants to fill shortfalls in airlift availability; this practice was convenient and represented efficient use of resources prior to 9/11. Since then, however, operational requirements have significantly decreased availability of “Blue Air Force” airlift assets, while simultaneously stressing AFSOC’s fleet at sustained levels for which the command was never manned or equipped. Whenever airlift requests go unfilled, and AFSOC subsequently uses its special-purpose C-130s to move cargo, it necessarily decreases availability for the missions those assets were designed to perform. The low-density nature of this fleet also means that mission-critical modifications and depot maintenance continuously impact a high percentage of the airplanes, and AFSOC must dedicate some of the mission-capable aircraft to training if the command is to create and sustain aircrew capabilities.

Because of these maintenance and training requirements, special operations airlift capacity is often insufficient to meet all combatant commander requirements. AFSOC's airlift deficit will get no better nor heal itself over time; the command's newest airlift-capable C-130s are nearly 20 years old, and the oldest are 46. AFSOC's senior leaders have identified the problem; the "Special Operations Airlift Capacity" topic was sponsored by HQ AFSOC/A5/8/9, then-Brigadier General Bradley Heithold. Gen Heithold sought "equal mission capability inherent in the medium lift legacy fleet aircraft while improving range, speed, payload, reliability, precision navigation, and capacity."¹

This paper analyzes the factors that contribute to the special operations airlift deficit, and it examines four very different aircraft as possible solutions. Each candidate is scored by comparing its capabilities against those of a baseline – the MC-130H – in the primary categories of runway, range, speed, payload, and capacity. Additional factors will include estimated cost and multi-role capability. The solution represents a paradigm shift – the time has come for AFSOC to enter the business of airlift. In addition to its special-purpose aircraft that also happen to have cargo capacity, AFSOC needs an organic platform built primarily for moving cargo.

Notes

¹ AFSOC, *Airlift Capacity*.

Traditional Airlift Support for and by AFSOC

Dedicated airlift capability was never designed into AFSOC; its C-130 fleet consists of roughly 90 aircraft in six highly-modified mission configurations.¹ The command owns just two 1963-vintage C-130E aircraft which have been upgraded to C-130H specifications, but nearly a half century after they were built, these two airplanes cannot approach the capacity or availability AFSOC needs. Further, these aircraft cannot be fenced to support the command's airlift needs; they are used primarily for specialized mission support and training. In the later part of the twentieth century, organic airlift capability would have been inconsistent with Air Force Doctrine for special operations, which states that "special operations forces...must complement, not compete with nor be a substitute for, conventional forces."² Dedicated airlift capability within AFSOC would have represented redundancy and inefficient use of taxpayer dollars. The Department of Defense's (DoD) effort to eliminate unnecessary redundancy has since been codified in the Quadrennial Defense Review (QDR) Report for 2006:

The goal is to manage the Department [of Defense] through the use of joint capability portfolios. Doing so should improve the Department's [sic] ability to meet the needs of the President and the Combatant Commanders. Moving toward a more "demand-driven" approach should reduce unnecessary program redundancy, improve joint interoperability, and streamline acquisition and budgeting processes. The Department [sic] is continuing to shift from stove-piped vertical structures to more transparent and horizontally-integrated structures.³

Ten years ago AFSOC had no need for organic airlift; even with fairly high airlift requirements from the rest of the DoD, requests to Air Mobility Command (AMC) from the special operations community were almost always filled because of their priority. The system, for the most part, worked as designed and as described in air mobility doctrine:

Air mobility forces are a finite but crucial resource to the Air Force and the nation. Consequently, the majority of those assets are centrally controlled by one command (AMC) that can quickly shift those resources wherever the combatant commanders or other government agencies need them most. The competing requirements of each are “racked and stacked” to determine priority and level of effort, and then tasked to support those requirements.⁴

As long as AFSOC was getting AMC support for most of its airlift requirements, it could easily cover shortfalls using its Low-Density/High-Demand (LD/HD) special-purpose C-130 variants. This practice represented efficient use of resources, but it came with some limitations. Many of AFSOC’s C-130 aircraft are designed for the insertion and extraction of SOF and their equipment, so they retain some cargo capacity. Their specialized mission equipment, however, reduces that capacity by more than the weight of the equipment itself. Refueling pods, electro-optical sensors, and electronic counter-measures all add aerodynamic drag to the airframe; that drag increases fuel burn while it decreases the altitude and airspeed capabilities of the airplane. Figure 1 shows a notional comparison between an AMC C-130H and an AFSOC MC-130H carrying the same cargo 1,500 miles, landing with a standard 6,000-pound fuel reserve. The

AFSOC airplane burns 1,000 pounds of fuel more because of its higher drag coefficient and lower cruise ceiling; it also must

Aircraft	Weight Pounds	Cargo Pounds	Altitude Feet	Fuel Flow	Speed Knots	Time Hours	Fuel Required	Gross Weight
C-130H	88,000	25,000	23,000	4,500	300	5.0	28,500	141,500
MC-130H	101,000	25,000	19,000	5,500	280	5.4	35,464	161,464

Figure 1.
Mission-weight comparison: C-130H vs MC-130H

sustain that fuel burn for 25 minutes longer. C-130 aircraft (except C-130J) are normally limited to a maximum gross weight of 155,000 pounds, so the Talon II crew needs one or more of the following:

- A gross weight waiver (can be granted up to 175,000 pounds when high-priority missions justify increased risk and airframe stress).
- A reduction in the cargo load.
- An enroute fuel stop.
- Tanker support for air-to-air refueling.

Even with these limitations and an identified airlift shortage in the 1990s – DoD studies indicated “not enough airlift to meet national needs”⁵ – AFSOC felt very little mission impact prior to 9/11. Missions requiring large movements of personnel and/or cargo generally carried enough priority to gain support from AMC, so AFSOC load planners could place smaller portions of the load onto organic mission aircraft.

Notes

¹ USAF, *Fact Sheets*.

² AFDD 2-7, *Special Operations*, 3.

³ DoD, *QDR*, 4.

⁴ AFDD 2-6, *Air Mobility Operations*, 8.

⁵ Bence, *Bedding Down with C-O-T-S*, 32.

Why Change Now?

The fact that an airlift shortage already existed in the 1990s was apparent only to those who lived inside of the problem. There was no conspiracy to hide the shortage, but the issue was largely transparent to the customers because of the expertise with which AMC allocated its limited resources. No amount of effort, however, could overcome the extraordinary demand for airlift in the post-9/11 environment. Just a year and a half earlier, Bence had warned the “airlift fleet [could not] meet current or projected national needs.”¹ It is doubtful even the most ambitious airlift advocates projected those national needs would ever approach the level at which they have remained for the last seven and one-half years.

AFSOC, like every other airlift-dependent entity, has felt the pain of the airlift shortage since 9/11. In order for AMC to maximize its support capability, it must “rack and stack” competing airlift requests, and then task available air mobility assets to support those requests.² When available air mobility resources are insufficient to meet all tasked requirements, AMC must flow most supported cargo when the aircraft are available, rather than on the specific date and time an individual “customer” like AFSOC would like its cargo to move. Personnel going to and from deployed locations, and cargo moving to those locations, carry enough priority to gain airlift, but many other AFSOC requests are unsupportable by AMC, which is why AFSOC can’t perform the *March 1999* scenario today. Even if the command could fit this kind of valuable training exercise into its schedule, the airlift requirements would force a reduction in the size of the package and eliminate some training events altogether. When its training requests go unfilled due to AMC’s overseas commitments, AFSOC must try to cover the shortfalls using its special-purpose C-130 variants. But those aircraft, and their crews, have been stressed by the

demands of the Long War at sustained levels for which the command was never manned or equipped.

Breaking the Fleet

Taken in isolation, the continuing commitments to OEF and Operation Iraqi Freedom (OIF) would represent a significant strain to AFSOC's LD/HD fleet. The command, however, also continues to support other contingencies worldwide, and it must dedicate some of its airlift-capable aircraft to training if it is to create and sustain aircrew capabilities. The high operational tempo (OPTEMPO) means the aircraft need more maintenance more frequently, but there is less time to perform that maintenance. Speaking at a National Defense Industrial Association conference in 2007, Major General Donald Wurster, then-vice commander of AFSOC expressed concern that many of the command's AC-130 gunships could be "grounded simultaneously" within two years because of the accelerated stress on their center wing boxes.³ The wing boxes, which attach a C-130's wings to its fuselage, were not programmed for replacement in the gunship fleet until at least 2013. Although gunship availability doesn't directly affect airlift capacity, AFSOC has thus far kept most of them flying by borrowing wing boxes originally slated for its MC-130H fleet, which is in danger of being grounded around 2010, also because of accelerated wing box fatigue.

AFSOC attempts to minimize the impacts of large maintenance events like wing box replacement by aligning them with periodic depot maintenance (PDM) and modification schedules. Thus, two individual projects that would each require 120 days might be completed concurrently in 150 days, but the low-density nature of AFSOC's fleet means that even efficient modifications and PDM continuously affect a high percentage of the airplanes. While proactive

management can decrease out-of-service time due to scheduled events, it can't solve the day-to-day maintenance problems that occur when the aircraft are being flown at up to four times their programmed utilization rate.⁴

It is in this area – daily aircraft maintenance and repair – that AFSOC feels the cumulative effects of seven and one-half years of continuous high OPTEMPO. Deployed maintenance is not yet a problem; robust deployment packages ensure highly-trained and qualified specialists are available to quickly identify and correct discrepancies with all aircraft systems. But their skill and dedication are not enough; they depend upon a strict rotation schedule that moves the aircraft out of the harsh desert environment and gets them home in time for critical preventative maintenance and inspections. An airplane can't come off the daily combat schedule until its replacement is ready to fly the mission, and here is where the system can start to break down. Home-station maintenance necessarily suffers because of the amount of personnel, parts, and equipment dedicated to deployed operations. Problems at home might mean a "fresh" airplane deploys up to a week late, and the deployed airplane it's scheduled to replace must overfly its scheduled home-station maintenance. These over-flights inevitably result in additional maintenance requirements when the plane finally returns to its already-stressed home-station maintenance unit.

Long-term combat stress on LD/HD aircraft, exacerbated by the additional airlift requirement, is why AFSOC today cannot execute the *March 2004* scenario. It is simply not possible to keep six MC-130s – nearly a third of the Talon II fleet, or one fourth of the Shadow fleet – deployed in combat for seven and one-half years. AFSOC has gained some relief in this area: a combination of mission changes and configuration updates means United States Central Command (CENTCOM) can now accept Talon IIs or Shadows, rather than both. This allows

AFSOC to rotate squadrons, rather than individual airplanes, which potentially allows the command to reconstitute its aircraft (and personnel) between deployments.

Reconstitution, however, doesn't erase airframe hours, and many of AFSOC's airlift-capable C-130s are older than the crews that fly them. These airplanes lack the precision navigation capability that some regions of the world require; AFSOC's C-130s transit these areas under temporary waivers. Finally, reconstitution cannot happen if home-station aircraft and crews are continually tapped to support special operations airlift requirements that don't make the cut during AMC's rack and stack.

More AMC Capacity?

A seemingly simple solution is to increase AMC's airlift capacity to meet the increased demand. The Air Force, however, cannot afford to build its fleet just to support "surge" requirements that aren't likely to exist in ten years. The Department of Defense also has a responsibility to private carriers who support contingency movements as part of the Civil Reserve Airlift Fleet (CRAF). These carriers maintain surplus capacity in exchange for a certain amount of government-guaranteed business.⁵ Air Force Chief of Staff General Norton A. Schwartz believes AMC's current capacity is sufficient to meet steady-state strategic airlift requirements and sustain the CRAF program.⁶

If additional capacity for AMC is not the answer, why not increase AFSOC's MC-130 fleet? The answer is twofold. First, expanding the command's legacy fleet would not meet the stated requirement of "improving range, speed, payload, reliability, [and] precision navigation;"⁷ it would only increase capacity. Second, it would be inefficient to increase AFSOC's airlift capacity by procuring more C-130s that aren't designed for airlift. The time has come to look for

a new aircraft for AFSOC, one that is first and foremost an airlifter. This aircraft will give the command the capability to economically, reliably, and responsively support special operations airlift requirements worldwide and within the United States, and it will lift part of the burden from AMC. Finally, ownership would give AFSOC the flexibility to modify its airlift assets to support special requirements, rather than having to use its special-purpose aircraft to support airlift requirements.

Notes

- ¹ Bence, *Bedding Down with C-O-T-S*, 40.
- ² AFDD 2-6, *Air Mobility Operations*, 8.
- ³ National Defense, *Gunships Could be Grounded*.
- ⁴ Ibid.
- ⁵ USAF, *Fact Sheets*.
- ⁶ Air Force Magazine. *Washington Watch*, 8.
- ⁷ AFSOC, *Airlift Capacity*.

Part 2

A Special Request

AFSOC's senior leaders recognize the command's lack of organic airlift as the problem it has become. When he was the Director of Plans, Programs, Requirements, and Assessments, then-Brigadier General Bradley Heithold requested research into a solution that provides "equal mission capability inherent in the medium lift legacy fleet aircraft while improving range, speed, payload, reliability, precision navigation, and capacity."¹ The solution may lie in acquiring new aircraft or modifying existing military or commercial airframes. Research revealed a surprising dearth of candidate platforms that meet both critical requirements: they must be able to carry a 20,000-pound payload 1,000 miles, and they cannot be 1960s-vintage C-130 airframes. Funding is not unlimited; in order to limit the total program cost, some additional constraints were applied. First, the estimated cost per unit should be no more than \$200M. Second, the candidates should come from an active or recent production line. Finally, they should require few modifications in order to function in the military airlift role. Four candidate aircraft are considered: the C-27J, C-130J, C-17A/B, and KC-767. Desired capabilities to be compared are listed below (in order of priority).²

- Cargo Capability Into Runways Less Than 5,000 Feet (Landing)
- Increased Payload
- Cargo Capability From Runways Less Than 5,000 Feet (Takeoff)
- Increased Capacity, in Ton-miles
- Increased Range
- Increased Speed

The capabilities analysis will score these attributes against a baseline MC-130H; this airframe best represents AFSOC's current airlift capability. Each candidate aircraft will receive a raw grade that equals the weighted totals of the individual attribute scores. Reliability and navigational precision will not be scored; there is no doubt that all candidates carry significantly increased capabilities in both categories relative to the Talon II. Comparing the reliability and navigation attributes of candidates to each other, however, would be distracting; the differences would be slight and the grading highly subjective. Three refined grade summaries will consider soft-field and multi-role capabilities plus cost savings; finally, the total grades will incorporate all scored attributes. The refined and total grades are provided for consideration only; General Heithold's request did not discuss short-field or multi-role capabilities. The raw grade, however, is not suitable as the primary input for a recommendation; \$200M aircraft predictably have higher capabilities scores than \$35M aircraft. The author's recommendation, therefore, is based primarily upon the cost grade.

Notes

¹ AFSOC, *Airlift Capacity*.

² AFSOC/A5RM Interview.

Baseline: MC-130H

The MC-130H Combat Talon II conducts “infiltration, exfiltration, and resupply of special operations forces and equipment in hostile or denied territory.”¹ It is built on the Lockheed-Martin C-130H airframe, but its extensive modifications include terrain-following/terrain-avoidance radar; upgraded avionics, communication, and navigational systems; and a strengthened cargo ramp that enables high-speed airdrop. The Talon II’s modifications add weight and drag, thereby decreasing its performance capabilities, and its navigation upgrades still cannot meet new requirements for European airspace.

The MC-130H can carry 35,000 pounds 1,000 miles, requiring 4,125 feet of runway for takeoff and 1,975 feet for landing at its destination. It cruises at 260 knots and can carry the nominal 20,000-pound payload 1,456 miles, but it achieves its maximum capacity of 14,950 ton-miles with



Figure 2. MC-130H

Photo Courtesy United States Air Force

a 25,000-pound load. The estimated cost of a Talon II, including airframe and modifications, is \$155M.² Some Talon IIs are configured for helicopter air-refueling, and they can land on unimproved airfields.

C-27J

The C-27J Spartan is a cooperative effort from Alenia North America, Global Military Aircraft Systems, and L3 Communications. The DoD selected it as the Joint Cargo Aircraft (JCA) for the Army and Air Force.³ It is designed to operate without support equipment from short, unimproved airfields; it can take off and land on 5,000-foot runways with its maximum payload of 25,353 pounds. At \$35M, the Spartan is the least expensive of the group, and it shows improvement over the Talon II in both speed and capacity. Compared to the other candidates, however, the C-27J places last in every category except cost, so it is not very competitive in the final analysis.⁴



Figure 3. C-27J

Photo Courtesy C-27J Team

C-130J

The C-130J is the newest iteration of Lockheed-Martin's Hercules airlifter. It has six-blade composite propellers, higher-performance engines, and upgraded avionics, communications, and navigational systems. The C-130J can operate into and out of 5,000-foot runways with its maximum payload of 41,790 pounds. It also offers lower operational costs than its predecessors, because it is designed



Figure 4. C-130J

Photo Courtesy United States Air Force

to operate with three crewmembers instead of five. The C-130J delivers significant improvements over the MC-130H baseline in every category, which illustrates why AFSOC's special-purpose aircraft are not well-suited for day-to-day airlift duties. The C-130J's estimated cost of \$55M compares favorably to the other candidates, but its overall cost score falls short because it finished second or third in most of the individually-graded categories.⁵

C-17A/B

The C-17A Globemaster III is a strategic airlifter that can also perform tactical airlift and airdrop missions. It is manufactured by the Boeing Company for the United States Air Force using commercial, off-the-shelf (COTS) equipment and avionics wherever possible.⁶ This practice takes advantage of economies of scale to reduce cost, and it helps ensure ready availability of spare parts.

The C-17A is designed to carry a 170,000-pound payload; this is by far the highest of the four candidates, and it can land that payload on a 5,000-foot runway.



Figure 5. C-17A

Photo Courtesy United States Air Force

Takeoff from that same runway limits the Globemaster III to 60,000 pounds of cargo, but this takeoff payload is still the best of the group. It can carry 160,000 pounds over 2,400 miles, which gives the aircraft the best capacity on the list at 193,600 ton-miles. The C-17A has the highest estimated unit cost in this analysis, but the aircraft's raw score pushes it to first place in

the weighted-cost, soft-field, and total scores. Boeing would like to sell the Air Force (or possibly AFSOC) its proposed C-17B, with extended range, more power, and a centerline main landing gear that would allow the aircraft to operate into and out of shorter airfields.⁷

KC-767

The Boeing Company developed the KC-767 initially on its extended range B767-200ER airframe, but has since shifted the multi-mission tanker onto its B767-300 airframe. The company is currently building the KC-767 for Italy, and might submit another proposal based on the aircraft when USAF re-opens the KC-X project. The KC-767 is designed to refuel multiple aircraft simultaneously, and can perform the refueling mission while passengers and/or cargo are on-board. This aircraft has the highest 1,000-mile payload capability in the



Figure 6. KC-767
Photo Courtesy Global Security.org

group, and it can carry 100,000 pounds 3,836 miles, giving it the highest range at maximum capacity. At 480 knots, the KC-767 is the fastest candidate, but its speed and airline underpinnings mean it also requires more runway than the other three. It can land in 5,000 feet with 165,000 pounds of cargo, but its takeoff payload from a 5,000-foot runway is less than the C-130J. The KC-767 is the only multi-role platform in the group – organic special operations aerial refueling capability carries many of the same benefits and justifications as does airlift – and its raw and total scores are second only to the C-17A.

Scoring the Candidates

The scoring is based on a ten-point individual capability baseline, AFSOC's prioritized capabilities list, and each candidate's percentage improvement over the baseline aircraft in each capability. Landing payload, for example, is the top priority and carries a nominal score of 10 points, based on the MC-130H's 35,000-pound capability as shown in Figure 7. As the baseline aircraft, the Talon II earns 10 points for landing payload in Figure 8; the C-27J can only carry 72-percent of the Talon II's payload, so its score in this category is 7.2.

Capacity, measured in ton-miles, represents a trade-off between range and payload. It is a measure of efficiency – the point at which adding cargo will decrease range, either due to less-efficient flight parameters or because fuel must be taken off to accommodate the extra weight. Capacity has an aggregate nominal score of 7 points; maximum capacity carries the most weight at 5 points, while its components of payload and range at maximum capacity each carry 1-point nominals.

Finally, the estimated cost is scored as a measure of unit cost savings relative to the baseline aircraft. The C-27J's score of 0.8 (see Figure 8) indicates a unit cost 80-percent lower than the MC-130H; the Spartan's weighted cost score is therefore 80-percent higher than its raw score. The weighted soft-field and multi-role scores (Figure 9) both apply 20-percent bonuses against the weighted cost score for aircraft that have those capabilities indicated in Figures 7 and 8. The total score accounts for both soft-field and multi-role capabilities; it can therefore be up to 40-percent higher than the weighted cost score.

Basic Capabilities Summary

	<i>MC-130H BASELINE</i>	C-27J	C-130J	C-17B	KC-767 **
Takeoff Payload, 5,000-ft Runway (Pounds)	35,000	25,353	41,790	60,460	35,000
Landing Payload, 5,000-ft Runway (Pounds)	35,000	25,353	41,790	170,900	165,000
Range w/ 20,000-pound Payload (Nautical Miles)	1,456	1,295	3,000	6,812	6,555
Cruise Speed (Knots True Airspeed)	260	315	339	462	480
Payload at 1,000 Miles (Pounds)	35,000	22,046	41,790	164,900	166,880
Maximum Capacity (Ton-miles)	14,950	15,211	36,750	193,600	191,800
Payload at Maximum Capacity (Pounds)	25,000	13,227	35,000	160,000	100,000
Range at Maximum Capacity (Nautical Miles)	1,196	2,300	2,100	2,420	3,836
Estimated Cost (Millions USD)	155	35	55	202	200
Reliability Increase		Y	Y	Y	Y
Precision Navigation		Y	Y	Y	Y
Soft Field	Y	Y	Y	Y	
Multirole	Y				Y

**Numbers in bold indicate best among candidate group*

***Complete performance charts are not available for KC-767; most KC-767 numbers are interpolated from available data.*

Figure 7. Basic Capabilities Summary

Scoring Summary

	<i>MC-130H BASELINE</i>	C-27J	C-130J	C-17B	KC-767
Takeoff Payload, 5,000-ft Runway (Pounds)	8.0	5.8	9.6	13.8	8.0
Landing Payload, 5,000-ft Runway (Pounds)	10.0	7.2	11.9	48.8	47.1
Range w/ 20,000-pound Payload (Nautical Miles)	6.0	5.3	12.4	28.1	27.0
Cruise Speed (Knots True Airspeed)	5.0	6.1	6.5	8.9	9.2
Payload at 1,000 Miles (Pounds)	9.0	5.7	10.7	42.4	42.9
Maximum Capacity (Ton-miles)	5.0	5.1	12.3	64.7	64.1
Payload at Maximum Capacity (Pounds)	1.0	0.5	1.4	6.4	4.0
Range at Maximum Capacity (Nautical Miles)	1.0	1.9	1.8	2.0	3.2
Estimated Cost (Millions USD)	0.0	0.8	0.6	-0.3	-0.3
Reliability Increase		Y	Y	Y	Y
Precision Navigation		Y	Y	Y	Y
Soft Field	Y	Y	Y	Y	
Multirole	Y				Y
Raw Score	45.0	37.6	66.6	215.2	205.7
Weighted Cost Score	45.0	66.8	109.5	149.9	145.9

Figure 8. Raw and Cost-weighted Scores

Note: The numbers in the Baseline column reflect relative weights applied to their respective categories, based upon the prioritized list of capabilities.

Final Scoring

	<i>MC-130H BASELINE</i>	C-27J	C-130J	C-17B	KC-767
Weighted Soft Field Score	54.0	80.1	131.4	179.9	132.6
Weighted Multirole Score	54.0	66.8	109.5	149.9	159.1
<i>TOTAL SCORE</i>	<i>63.0</i>	<i>80.1</i>	<i>131.4</i>	<i>179.9</i>	<i>159.1</i>

Figure 9. Refined and Total Scores

Notes

¹ USAF, *Fact Sheets*.

² Ibid.

³ USAF. *Spartan Named as JCA*.

⁴ C-27J Team Web Page.

⁵ USAF, *Fact Sheets*.

⁶ Ibid.

⁷ Janes. *All the World's Aircraft*.

Part 5

Conclusions and Recommendations

Air Force Special Operations Command has a justifiable requirement for an organic airlift platform. Rather than duplicating Air Mobility Command capabilities, an AFSOC-owned airlifter would augment AMC by providing highly-responsive and flexible support to the special operations community. It would allow AFSOC to use its over-tasked special-purpose C-130s primarily for the missions they were built to perform, and to train aircrew members in those missions. This would, in turn, extend the service life of AFSOC's C-130 fleet. Finally, because AFSOC would need to request far fewer AMC missions, the presence of a dedicated special operations airlift program would relieve some of the burden on an over-tasked AMC system.

Four very different aircraft were considered as candidates for this project. The C-27J has significantly less payload capability than any of the other candidates, but it can operate into and out of many more airfields, and it costs much less than the other three. The C-130J offers a reasonable balance of all specified capabilities, but doesn't excel in any category. The C-17A has the highest payload capability in the group, and it can operate from most of the same airfields as the C-130J. Finally, the KC-767 is the only multi-role candidate, and its airline heritage helps give it the best range.

In a group of aircraft with such a wide range of capabilities, one could expect cost to be an equalizing factor, and in this comparison that is true – to an extent. The weighted-cost scores are

much closer than the raw scores, but even with this adjustment, the C-27J simply isn't competitive. An AFSOC airlifter must be able to quickly deliver a large amount of cargo to any intermediate staging base in the world, and the C-27J lacks sufficient capacity to justify the investment.

The weighted-cost score for the C-130J is closer to those of the two heavy aircraft, because the C-130J more than doubles the capacity of AFSOC's MC-130H, and it does it at a much lower cost than the specially-modified Talon II. But the C-130J's refined scores can't overcome its third-place finish in six measured categories, so the real competition is between the two large airplanes.

The KC-767's sleek airline design gives it the best speed and fuel efficiency in this group, and its air-to-air refueling capability would be a tremendous asset to AFSOC. The command depends on this capability to move its heavy, high-drag C-130s across the globe or across the United States, and to accomplish the mission when they get there. This author considered applying more weight to the multi-role score, but AFSOC did not list refueling as one of its desires. The command, in fact, specified that any multi-role capability must not detract from the aircraft's airlift performance.¹ The KC-767 was originally designed to operate into and out of international airports, and it was meant to move passengers, not cargo. Its size and interior volume make it competitive, but it still can't quite measure up to the only aircraft in this group that was conceived and designed as a high-capacity military airlifter.

The C-17 is, therefore, recommended as a solution for AFSOC's airlift deficit. The C-17A is still in production, and it would require no initial modifications to answer AFSOC's immediate needs. If the command wants even better short-field capability, the C-17B is a possibility, but Boeing does not yet have other buyers for it; development costs might be prohibitive if AFSOC

has to absorb them within an estimated eight- to twelve-aircraft C-17B fleet. Nevertheless, the existing C-17A design can operate from most of the same airfields AFSOC currently uses, and it would give AFSOC everything General Heithold asked for: range, speed, payload, reliability, precision navigation, and capacity.² If Air Force Special Operations Command needs organic airlift capability – and this study indicates it does – then AFSOC needs its own C-17 fleet.

Notes

¹ AFSOC/A5RM Interview.

² AFSOC, *Airlift Capacity*.

Appendix A

AFSOC Topic Submission (extract)

Academic Year 2009
Submitting Organization AF Special Operations Command
Topic Title Special Operations Airlift Capacity
Unclassified Topic Description: Due to operational and training requirements, SOF airlift capacity is often insufficient to meet all COCOM requirements. SOF airlift capacity is derived from several Low Density / High Demand (LD/HD) aircraft fleets which are significantly impacted by depot maintenance, aircraft modifications, and elevated increased operations tempo. These aircraft also suffer from typical aging aircraft symptoms which exacerbate the LD/HD problem through increased maintenance costs and longer maintenance down times resulting in fewer flying hours per maintenance man hour. Based on current force structure and aging aircraft problems, additional SOF airlift aircraft are capacity is needed to meet demand. Topic Objectives: Recommend a solution which considers the following major components: The solution must provide equal mission capability inherent in the medium lift legacy fleet aircraft while improving range, speed, payload, reliability, precision navigation, and capacity to meet current and foreseeable future COCOM SOF airlift requirements. Solution could involve a variety / combination of medium airlift platforms which increase SOF airlift capacity through acquisition of new aircraft or conversion of existing late model legacy military or commercial airframes. Recapitalization of medium lift legacy SOF airlift capability must be considered. Solution for shortfall should not include the modification of 1960's vintage C-130E airframes.

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Appendix B

Blue Dart

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Vital Redundancy

The United States Air Force Special Operations Command (AFSOC) today faces a critical shortage of airlift capacity. The Air Mobility Command (AMC) system that should ideally support AFSOC's airlift requirements is saturated with the demands of the post-9/11 world, so AFSOC cannot always get airlift support when and where it needs it. Ten years ago AFSOC got almost all the support it asked for, and it was able to fill minor gaps by using its special-purpose C-130s, including its MC-130H Talon II. This was consistent with the doctrinal concept that special operations capabilities should compliment – not duplicate – conventional capabilities.

AFSOC's aircraft and crews are now critically overworked at the same time, and for the same reasons, as AMC's fleet. The aircraft require more maintenance more frequently than they did in the 1990s, and some are actually in danger of being grounded for wing cracks. Further, the low-density nature of AFSOC's C-130 fleet means that increased maintenance requirements affect a significant percentage of the force, thereby decreasing mission capability. Though the

concept would have been doctrinally unsupportable ten years ago, it is now necessary to build organic airlift capability into AFSOC.

A special operations airlifter should be able to operate from the airfields AFSOC currently uses, while giving AFSOC increased capabilities in areas like range, speed, and payload. A list of candidates includes the C-27J Spartan, selected by the DoD selected it as the Joint Cargo Aircraft (JCA) for the Army and Air Force. It costs a mere \$35M, and it beats the Talon II in both speed and capacity.

Lockheed-Martin's newest C-130J Hercules has higher-performance engines, and upgraded avionics, communications, and navigational systems. It offers lower operational costs than its predecessors, and delivers significant improvements over the MC-130H.

Boeing's KC-767 is designed to refuel multiple aircraft simultaneously, and can perform the refueling mission while passengers and/or cargo are on-board. It can fly at 480 knots and land in 5,000 feet with 165,000 pounds of cargo, but it requires more runway for takeoff than does the C-130J.

Analysis indicates the C-17A has nearly five times the payload and almost 13 times the ton-mile capacity of the MC-130H, and the C-17 can operate from most of the airfields AFSOC uses today. The C-17A was conceived and designed as a military airlifter, it has an active production line, and it comes with a worldwide Air Force support infrastructure.

The time is right, and the requirement is real – Air Force Special Operations Command needs an organic airlift platform. AFSOC needs the C-17A.

Maj Schaeffer is an AC-130 pilot with over 5,500 flight hours and 1,000 combat hours.

Keywords: AFSOC, airlift

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